Supplementary file

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Medline search strategy

Search	Search
1	exp Brain Injuries/ or exp Spinal Cord Injuries/ or exp Paraplegia/ or Quadriplegia/ or Hemiplegia/ or Cerebral Palsy/ or exp Stroke/ or exp Spinal Dysraphism/ or exp Limb Deformities, Congenital/
2	exp Congenital Abnormalities/ or exp Muscular Dystrophies/ or exp Poliomyelitis/ or exp Multiple Sclerosis/ or Amputees/ or Parkinson Disease/ or exp Guillain-Barre Syndrome/ or Arthrogryposis/
3	Friedreich Ataxia/ or exp Spinocerebellar Ataxias/ or exp Disabled Persons/ or exp Intellectual disability/ or Developmental Disabilities/ or Motor Skills Disorders/ or Autistic Disorder/
4	(brain adj2 injur*).tw.
5	(cerebral adj2 pals*).tw.
6	(multiple adj2 sclerosis).tw.
7	(spinal cord injur* or paraplegi* or quadriplegi* or tetraplegi* or monoplegi*).tw.
8	(stroke or cerebrovascular accident or CVA or hemiplegia).tw.
9	(spina bifida or limb deficienc* or muscular dystroph* or polio* or amput* or parkinson* or brachial plexus injur* or guillian-barre syndrome or arthrogryposis or achondroplasia or friedreich* ataxia or spinocerebellar ataxia).tw.
10	(disab* adj3 people).tw.
11	(disab* adj3 athlet*).tw.
12	(physical* adj3 disab*).tw.
13	(physical* adj3 handic*).tw.
14	(physical* adj3 impair*).tw.
15	(physical* adj3 challeng*).tw.
16	(motor handic* or locomotor handic* or motor disab* or locomotor disab* or congenital abnormalit*).tw.
17	(down syndrome or trisomy 21 or intellectual disab* or intellectual handicap or intellectual retard* or mental retard*).tw.
18	(development* disab* or development* retard* or development* delay* or global developmental delay or global development delay or developmental coordination disorder or DCD).tw.
19	(ABI or acquired brain injury or TBI or traumatic brain injury or SCI or autism or autism spectrum disorder or autistic disorder or ASD or asperger syndrome or neuromuscular disorder).tw.
20	(wheelchair and (basketball player* or user* or athlete*)).tw.
21	Muscle Weakness/ or Leg Length Inequality/ or exp Muscle Hypertonia/ or Muscle Spasticity/ or exp Dystonia/ or exp Ataxia/ or Athetosis/ or exp Contracture/
22	(muscle weakness or limb deficiency or leg length difference or short stature or hypertonia or spasticity or dystonia or ataxia or athetosis).tw.
23	($coordination or dexterity or contracture or intellectual impair* or development* impair* or mobility impair*).tw.
24	(joint adj2 mobility).tw.
25	(range adj2 motion).tw.
26	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25
27	Baseball/ or Basketball/ or Bicycling/ or Boxing/ or Football/ or Golf/ or Gymnastics/ or Hockey/ or exp Martial Arts/ or exp Racquet Sports/

Search	Search
28	Return to Sport/ or exp Running/ or Skating/ or exp Snow Sports/ or Soccer/ or Sports for Persons with Disabilities/ or exp Swimming/
29	Volleyball/ or exp Water Sports/ or Weight Lifting/ or Wrestling/
30	"Track and Field"/
31	(adaptive mountain bik* or adaptive sports or AFL or alpine ski* or archery or athletics or badminton or basketball or biathlon or biking or boccia or boxing or canoe* or cricket or crosscountry ski* or curling).tw.
32	(cycling or diving or duathlon or equestrian or fencing or football or golf or gymnastics or handball or hippotherapy or hockey or horseback riding or horse riding or judo or kayak or kickboxing or lawn bowls).tw.
33	(marathon or netball or para-badminton or paracycling or parasnowboard or paratriathlon or polo or powerlifting or runn* or rowing or sailing or shooting or skating or skiing or snowboard or soccer or sport*).tw.
34	(surfing or swimming or table tennis or taekwondo or tae kwon do or tenpin bowling or tennis or trampolin* or triathlon or volleyball or volley).tw.
35	(wheelchair and (aussie rules or australian football or basketball or curling or fencing or racing or rugby or sport* or tennis)).tw.
36	(winter sport* or wrestling).tw.
37	Dancing/ or Mountaineering/ or Yoga/ or Tai Ji/
38	(active recreation or bushwalking or danc* or fishing or foxtrot or hiking or rock climbing or sailability or scuba or tai chi or tango or waltz or yoga).tw.
39	(physical adj2 recreation*).tw.
40	27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
41	26 and 40
42	Limit 41 to (humans and “all adult (19 plus years)”

Note: sports listed in rows 27 to 38 were used in the EndNote search to identify potential studies for part two of the review

Included studies

Abel et al (2003)
Abel T, Kröner M, Vega SR, Peters C, Klose C, Platen P. Energy expenditure in wheelchair racing and handbiking - a basis for prevention of cardiovascular diseases in those with disabilities. *Eur J Cardiovasc Prev Rehabil.* 2003;10:371-376. PubMed ID: 14663299 doi:10.1097/01.hjr.0000096542.30533.59

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Akbar M, Brunner M, Ewerbeck V, Wiedenhöfer B, Grieser T, Bruckner T, Loew M, Raiss P. Do overhead sports increase risk for rotator cuff tears in wheelchair users? *Arch Phys Med Rehabil.* 2015;96:484-488. PubMed ID: 25449196 doi:10.1016/j.apmr.2014.09.032

Antonietti et al (2008)
Antonietti LS, Costa RA, Gondo FLB, Oliveira ASB, Chiarello B. Avaliação comparativa em lesados medulares sedentários e praticantes de basquetebol em cadeira de rodas (Comparative evaluation in spinal cord injured sedentary patients and wheelchair basketball players) [Portuguese]. *Revista Neurociencias.* 2008;16:90-96. PubMed ID: doi:10.34024/rnc.2008.v16.8643

Ascione et al (2018)
Ascione A, Belfiore P, Di Palma D. Sports program to promote the wellbeing of people with disabilities. *Arch Sicil Med Chir 4 Acta Med Mediterr.* 2018;34:1261-1263. PubMed ID: doi:10.19193/0393-6384_2018_5_194

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Ashton-Shaeffer C, Kinney J, Brown K, Kinney T. Survey of injuries sustained by division II and division III wheelchair basketball athletes. *Annual in Therapeutic Recreation.* 2010;18:87-99. PubMed ID:

Ayán et al (2014)
Ayán C, Cancela JM, Fernández B. Changes in wheelchair basketball performance indicators throughout a regular season: a pilot study. *Int J Perform Anal Sport.* 2014;14:852-865. PubMed ID: doi:10.1080/24748668.2014.11868763

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Badenhorst M, Runciman P, Brown JC, Swartz L, Derman WE. Promotion of para athlete well-being in South Africa (the PROPEL studies): profiles and prevalence of psychological distress. *J Sci Med Sport.* 2021;24:616-621. PubMed ID: 33431317 doi:10.1016/j.jsams.2020.12.013

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Barak et al (2019)
Barak S, Oz M, Dagan N, Hutzler Y. The Game of Life soccer program: effect on skills, physical fitness and mobility in persons with intellectual disability and autism spectrum disorder. *J Appl Res Intellect Disabil.* 2019;32:1401-1411. PubMed ID: 31124217 doi:10.1111/jar.12620

Başar et al (2013)
Başar S, Ergün N, Yiğiter Bayramlar K. A comparative study of muscle strength and anaerobic power of the young national and national junior wheelchair basketball players. *Türk Fiz Tıp Rehab Derg [Turk J Phys Med Rehab].* 2013;59:325-329. PubMed ID: doi:10.4274/tftr.26594

Bentley et al (2002)
Bentley DJ, Phillips G, McNaughton LR, Batterham AM. Blood lactate and stroke parameters during front crawl in elite swimmers with disability. *J Strength Cond Res.* 2002;16:97-102. PubMed ID: 11834113

Bernardi et al (2012)
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Bernardi M, Castellano V, Ferrara MS, Sbriccoli P, Sera F, Marchetti M. Muscle pain in athletes with locomotor disability. *Med Sci Sports Exerc.* 2003;35:199-206. PubMed ID: 12569204 doi:10.1249/01.MSS.0000048635.83126.D4

Bernardi, Di Giacinto et al (2003)
Bernardi M, Di Giacinto B, Pisicchio C, Quattrini FM. Lo sport praticato dai disabili con patologia locomotoria è in grado di determinare effetti benefici sulla salute? (Are sports practiced by athletes with locomotor disabilities effective in determining health benefits?) [Italian]. *Med Sport (Roma).* 2003;56:277-286. PubMed ID:

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Bhambhani YN, Burnham RS, Wheeler GD, Eriksson P, Holland LJ, Steadward RD. Ventilatory threshold during wheelchair exercise in untrained and endurance-trained subjects with quadriplegia. *Adapt Phys Activ Q.* 1995;12:333-343. PubMed ID: doi:10.1123/apaq.12.4.333

Blauwet et al (2013)
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Cyr AK, Colorado BS, Uihlein MJ, Garlanger KL, Tarima SS, Lee K. Prevalence of lateral epicondylosis in veteran manual wheelchair users participating in adaptive sports. *J Spinal Cord Med.* 2022;45:238-244. PubMed ID: 32527209 doi:10.1080/10790268.2020.1771243

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Dallmeijer AJ, Hopman MTE, Angenot ELD, van der Woude LHV. Effect of training on physical capacity and physical strain in persons with tetraplegia. *Scand J Rehabil Med.* 1997;29:181-186. PubMed ID: 9271153

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Study design

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Measures during game or training

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Additional table A for results of studies comparing different subgroups of sport participation: Results of studies comparing the five different types of subgroup comparisons classified as favours 1 or more subgroups (favours) and insignificant (insignif).

Domain & variable	Comparison									
	Sport played		Health condition		Level of competition		Amount of participation		Team versus individual sport	
	Favours	Insignif	Favours	Insignif	Favours	Insignif	Favours	Insignif	Favours	Insignif
Participation										
Community integration					1				1	
Employment +/- education	1			1		2				
Quality of life										
Individual Domains			1			1				
Total score	2				2	1	1		1	2
Activity										
Balance	1	1	1							
Combined task mobility (eg, Timed Up and Go)	1		1							
Combined mobility (eg, Wheelchair Skills Test)	1									
Activities of daily living						1				
Carrying, moving and handling objects					1					
Walking/running speed			1							
Cognitive/behavioural impairment										
Anxiety	1	1				1		1	1	
Depression	1	1			1	1	2		1	
Fatigue (cognitive)	1	1				2		1		
Intelligence						1				
Cognitive impairment	1	1								
Negative affect					1					
Physical impairment										
Strength	1	1		1	1			1		
Trunk impairment	1									
Anaerobic power	1	1	1	1		1				
Aerobic fitness	7		6	2		1		1		
Spasticity	1									
Care needs or socioeconomic impact					1	1				

Domain & variable	Comparison									
	Sport played		Health condition		Level of competition		Amount of participation		Team versus individual sport	
	Favours	Insignif	Favours	Insignif	Favours	Insignif	Favours	Insignif	Favours	Insignif
Adverse events										
Injuries	6	2	7	2	1	3	4			
Injuries or illness		1		2						1
Illness						2	1			
Falls										
Pain	1	2	2	3						
Events						1				

Additional table B for results of studies comparing different subgroups of sport participation: type of comparison (rows) for results that favour one subgroup for each outcome domain (columns). Each dot point is a single study

Type of comparison	Participation	Quality of life	Activity	Cognitive or behavioural impairment	Physical impairment	Care needs or socioeconomic impact	Adverse events
Sport played	• Basketball, swimming	• Basketball (vs. boccia) • Tennis (vs. boccia)	• Track and field (vs. basketball) • Mini tennis (vs. football/soccer) • Basketball (vs. boccia)	• Mini tennis (vs. football/soccer) • Badminton (vs. regular gymnastics) • Swimming (vs. basketball) • Swimming (vs. basketball)	• Handbiking (vs. wheelchair racing) • Nordic sit skiing (vs. curling, alpine sit skiing, ice sledge hockey) • Alpine sit skiing (vs. Nordic sit skiing, curling) • Alpine sit skiing, ice sledge hockey (vs. Nordic sit skiing, curling) • Nordic sit skiing, track (vs. basketball, alpine sit skiing, swimming, tennis, fencing, field, archery, table tennis, target shooting) • Athletics (vs. basketball, table tennis, weightlifting, fencing, archery) • Basketball, sled hockey (vs. wheelchair rugby, adaptive rowing) • Basketball (vs. crutch football/soccer) • Endurance athletes (vs. non-endurance) • Basketball (vs. boccia) • Aerobic sports (vs. anaerobic)		• Swimming (vs. sit volleyball) • Amputee football/soccer (vs. table tennis, basketball) • Adaptive rowing (vs. sled hockey, basketball, wheelchair rugby) • 'Other sports' e.g., swimming (vs. athletics, sit volleyball, tennis) • Wheelchair racing, lawn bowls, tennis, handcycling, table tennis, archery, athletics, swimming (vs. basketball) • Weightlifting, field, swimming, archery, table tennis, slalom, bowling, pool/billiards (vs. road racing, basketball, track, tennis) • Wheelchair rugby, field, tennis, weightlifting, swimming, racquetball, riflery, slalom (vs. basketball, track, road racing)

Type of comparison	Participation	Quality of life	Activity	Cognitive or behavioural impairment	Physical impairment	Care needs or socioeconomic impact	Adverse events
Underlying health condition		• Arm impairment had higher quality of life than leg impairment	• Athletes with intellectual disability excluding those with Down syndrome had better mobility than those with Down syndrome • Athletes with intellectual disability excluding those with Down syndrome had better balance than those with Down syndrome • Timed up and go improved more in autism spectrum disorder than in intellectual disability		• Other disabilities had higher aerobic fitness than paraplegics • Athletes without spinal cord injuries had higher aerobic fitness than athletes with spinal cord injuries • Athletes without spinal cord injuries had higher aerobic fitness than athletes with spinal cord injuries • Athletes with intellectual disability excluding those with Down syndrome had better anaerobic power than those with Down syndrome • Walking athletes with cerebral palsy had higher aerobic fitness than wheelchair-bound athletes with poliomyelitis • Athletes with poliomyelitis had higher aerobic fitness than athletes with spinal cord injuries • Athletes without spinal cord injuries had higher aerobic fitness than athletes with spinal cord injuries		• Athletes with cerebral palsy, spina bifida or amputation had fewer injuries than athletes with spinal cord injuries or poliomyelitis • Wheelchair basketballers with spinal cord injury or spina bifida had less shoulder pain than players with amputation • Athletes with musculoskeletal disease had less injuries than athletes with spinal cord injuries • Athletes with spinal cord injuries or 'other' underlying health conditions had less injuries than athletes with cerebral palsy • Athletes with musculoskeletal conditions have less injuries than athletes with neural conditions • Athletes with 'other' underlying health conditions have less injuries than athletes with spinal cord injuries • Athletes with cerebral palsy or 'other' underlying health conditions have less pain than athletes with spinal cord injuries or amputation • Athletes with amputation or spinal cord injuries exhibit less concussive symptoms than athletes with brain disorders • Athletes with good trunk control have less injuries than those with poor trunk control

Type of comparison	Participation	Quality of life	Activity	Cognitive or behavioural impairment	Physical impairment	Care needs or socioeconomic impact	Adverse events
Athlete level of competition	• Elite level sport had better community integration than regional or local level	• Elite level sport had better quality of life than regional or local level • Elite level sport had better quality of life than competitive level	• Competitive volleyball training had better carrying, moving and handling objects than non-competitive volleyball training	• Local level sport had lower negative affect than regional level sport • Medal winning athletes had lower depression than athletes who did not win medals	• Young national wheelchair basketballers had higher strength than national junior wheelchair basketballers	• Competitive athletes had less physician visits than local athletes	• National, regional and recreation level athletes have less injuries than international athletes
Amount of participation		• More training sessions/week (3-6 sessions) had better quality of life compared to less training sessions/week (2 sessions)		• High-active athletes had less depression than low-active athletes • More training sessions/week (>= 2) had lower depression compared to less training sessions/week (<=1)			• Training less frequently (2-10 hours/week) has less injuries than training more frequently (12-15 hours/week) • Training less frequently (1-5.5 hours/week) has less injuries than training more frequently (6-10 hours/week) • Wheelchair marathon racers and played other wheelchair sports had less injuries than those who only undertook marathon racing • Athletes with middle training loads had fewer injuries and illnesses than those with high or low training loads • Athletes who train more (>= 8 hours/week) have fewer injuries than those that train less (< 8 hours/week)

Type of comparison	Participation	Quality of life	Activity	Cognitive or behavioural impairment	Physical impairment	Care needs or socioeconomic impact	Adverse events
Team vs. individual sport	• Individual sports had better community integration than team sports	• Team sports had better quality of life than individual sports		• Team sports had lower anxiety scores than individual sports • Team sports had lower depression scores than individual sports			